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ABSTRACT

In educational environments, it is desirable to support the mechanism by which people can participate in interesting communities without any trouble and also to promote successful learning activities. Now that Web-based environments have been successively organized under a virtualized communication network or a logical interaction space, the architectural framework must be investigated. This paper addresses an architectural framework for handling knowledge in education from a viewpoint of personal activity. The objective is to design the support environment for personal activity in education, based on the seamless transition mechanism among individual educational environments. A three-layers model is introduced for educational support architecture. The three layers are educational environment, support system, and person role, from top to bottom. The lower layer is organized so as to contain the functional features in the upper layer, as basic and composite facilities for the construction. (Author)

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A Framework for Managing Personal Knowledge Activity in Education

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Abstract *In educational environment, it is desirable to support the mechanism by which persons can participate in their interesting communities without any troubles and also promote their learning activities increasingly or successfully. In particular, now that web-based educational environments have been successively organized under a virtualized communication network or a logical interaction space the architectural framework must be investigated. In this paper, we address an architectural framework of handling knowledge in the education from a viewpoint of personal activity. Our objective is to design the support environment of personal activity in the education, based on the seamless transition mechanism among individual educational environments. In order to make the viewpoint of our investigation clear we introduce a three-layers model for educational support architecture. Three layers are educational environment, support system and person role, from the top layer to the bottom layer. The lower layer is organized so as to contain the functional features in the upper layer, as basic and composite facilities for the construction.*

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Introduction

The computer systems coupled with information networks take important roles to establish the infrastructure for information society from a logical point of view, in comparison with the infrastructure for our social life-lines to be supported traditionally by architecture or civil engineering. So, the knowledge infrastructure environment grows up without any doubt as our information-oriented society to be desirably expanded in the 21st century. Our daily activities are more or less dependent on the utilization/adaptation of our heuristically-experienced or traditionally-accumulated knowledge, and the effectually computer-supported mechanisms must be investigated to establish such knowledge infrastructure environments[1].

The computer support for educational activity is one of important subjects, and until today various research subjects have been investigated eagerly and progressively. Many of these traditionally investigated subjects unfortunately were disjoint from other research viewpoints with a view to establishing globally or cooperatively integrated educational environment. This historical trend may be dependent on the large desirability and dream of educational application for computer power. The discussions or considerations of educational activity or knowledge growing process should be sufficiently exchanged or attacked. Concerning with knowledge growing process, I.Nonaka, et al. proposed an aggregated model (e.g. SECI model) for knowledge management[2,3]. Although SECI model is not always appropriate to investigate educational activities of persons, at least the framework is very interesting in our discussion. Also, we have already discussed an architecture for handling knowledge in education with a view to designing uniformly integrated educational support system[4-6]. However, our conventional research project did not focus on the educational support framework for personal activity because our research view was dependent on the educational support mechanism in the organization, like SECI model.

In this paper, we discuss the constructive framework of handling knowledge in the education from a viewpoint of personal activity, but not with respect to complementary trainings or exercises in the organization. Our objective is to design the support environment of personal activity in the education, based on the seamless transition mechanism among individual educational environments. In order to make this modeling viewpoint clear, we introduce three-layers model for educational support architecture. Three-layers model arranges analytically our knowledge activity with respect to three measurements: educational environment, support system and person role. We address our modeling mechanism

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successfully, based on the correspondence between upper and lower layers with a view to making it explicit that educational activities defined in the environment should be interpretatively implemented as the behaviors of individual persons.

Framework

The effective environment of knowledge management in the education must support various behaviors of individuals smartly without any operational differences because the personal activities are too strongly dependent on the personality and progressiveness of individuals but are not uniformly controlled under the organization. Of course, it is very difficult to attain this requirement sufficiently since ordinarily we are not always assisted well to our educational activities by man-to-man or by one-to-one relationship, but in many cases act in ourselves or are supported together by one-to-many relationship. Our educational support architecture is illustrated conceptually in Figure 1. This architecture is composed of three layers: educational environment, support system and person role. In three layers, different modeling views are correspondingly mapped from the upper layer to the lower layer so that the modeling characteristics in the upper layer should be constructed interpretatively by the corresponding characteristics in the lower layer.

The educational environment points out distinguishable categories in our educational activities: private learning, group learning, group lecture and private lesson. These distinguishable categories are observed from our practically experienced education systems: the private learning is corresponding to our self-learning such as pre-learning and post-learning for school lectures; the group learning does to the discussions, meetings, exercises, etc.; the group lecture does to school lecture, public seminar, etc.; and the private lesson does to man-to-man lesson, private coaching, etc. Of course, these categorized activities are functionally established by means of any educational support systems such as CAL (Computer Assisted Learning) for private learning, CSCL (Computer Supported Collaborative Learning) for group learning, CAI (Computer Assisted Instruction) for group lecture and ITS (Intelligent Tutoring System) for private lesson. These educational support systems have been developed with a view to being apt respectively to individual education systems, which are currently organized as social structures/mechanisms. Of course, these support systems must be applicable to various types of users, who take roles to keep effectually instructional and conversational interactions. The person role makes the interactive- or functional-tasks of persons, who take plays actively or passively according to their situations and objectives in individual educational environments, explicit.

The functionality in the educational environment is interpretatively mapped into educational behaviors of persons and the educational environment is explicitly defined as the practical paradigm. The person roles can be looked upon as the features of users in the educational support systems, and student, teacher, tutor, coordinator, speaker, etc. are effectual roles. The educational environment in the top layer is individually categorized by characteristics of educational support systems and the categorized educational support systems are characterized by the roles of participated persons as actors. So, it is important for the educational environment to organize seamless activity fields in accordance with person roles and also construct the functionality of making seamless activities possible among person roles. Of course, the person role is variant for individuals: the same person may take different roles in accordance with the objectives/motivations for the educational activities.

Support View for Educational Activity

In the educational environment, the educational styles which we can distinguish in the real world are categorized into the private learning, group learning, group lecture and private lesson. These educational styles are distinguished in accordance with two factors: the number of students and the number of teachers. The number of students is 1 or n ($n>=2$), and the number of teachers is 0 or 1, respectively. Figure 2 locates such educational styles into two-dimensional space with respect to these two factors. Of course, we often observe the educational activity in which the teacher is a basic composite actor even on the group learning: in particular, in the large-scale group discussion which has not been associated with leaders, the teacher takes an important role as an advisor or a coordinator. Figure 2 does not define the categorization for our educational activities of persons, but arranges the constructive relationship among different educational styles.

As for these educational styles, today the typical educational support systems, which are currently usable

or proposed, are classified into four types of system configurations such as CAL, CSCL, CAI and ITS. These support systems are correspondingly consistent to four styles of educational activities. Figure 3 shows such a corresponding relationship between educational styles and educational support systems. In Figure 3, it is strongly drawn that CSCL and ITS related respectively to the group learning and private lesson are not strictly constrained by two factors: number of students and number of teachers. CSCL and ITS are depicted so as to be expanded to the partitioned domain "group lecture" (which is defined by many students and a teacher), assigned to CAI. In CSCL, the presentation process in the symposium or congress is similar to that in the group lecture in many cases. Similarly, ITS is extensible to the domain of CAI in case that one tutor teaches or discusses a few students together at once or one by one. At least, students are timely located to one of four types of educational support systems, according to their educational activities and pre-assigned schedules of learning. Thus, it is important that the seamless transition mechanism among different educational support systems should be implemented. Of course, these educational support systems are not adaptable to only students, but also must be applicable to persons such as teachers, advisers, instructors, etc., related closely to students. Table 1 arranges person roles for this discussion about extended support activities. Figure 3 shows the improved interaction among individuals in each educational style: in comparison with Figure 2, the interactive relationships among composite elements are complex in CSCL and ITS. Namely, this improvement insists that individual educational support systems should provide adaptable facilities to different classes of persons in accordance with person roles, which have to be done in the educational activities.

Seamless Activities among Educational Styles

Figure 4 illustrates different classes of persons in each educational support system. Here, we must pay an attention that the person role in each educational support system is pre-assigned when the transitive movement from the private learning to another is occurred: for example, a person takes a role of university student in one case, and in another case he takes a play of tutor for students in an elementary school. Additionally, all educational activities are started on the private learning as the origin. This is because the private learning is looked upon as the pre-education for various educational activities. In Figure 4, persons who participate in the group learning are categorized into three types according to the size or scale of meeting: small-size, large-size and symposium-like meetings. Also, in such meeting categories persons are classified into students, coordinators and speakers. Namely, three kinds of meetings are distinguished by the construct among these composite actors: the small-size meeting is organized only by students; the large-size meeting is controlled by the coordinator so as to carry on the discussion in the well direction or promote active information exchanges; and in the symposium-like meeting speakers (or presenters) newly participate with the help of coordinator.

Figure 4 shows the transitional relationship among different educational activities attended with person roles. Ideally, it is hopeful that the environment should support various styles of educational activities by the cooperative mechanism among different functions. The educational environment which can support the seamless sequence among various actions and reactions powerfully is better. We investigate the seamless activities in Figure 4 with respect to person roles. Figure 5 shows various types of transitive processes among different support systems. The private learning is interpretatively looked upon as the pre-stage for another educational activity, and when one objective or successive behavior of personal plan is scheduled, a sequence of actions must be determined with person role, which was assigned in the private learning. In various educational styles, persons prepare their learning subjects to participate in pre-assigned meetings/parties. The person roles for participation are very changeable in accordance with occasional motivations. In this case, the private learning is a very simple and fundamental stage, and also is regarded as the pre-learning and post-learning phases for another educational style. Thus, the educational support system must always work cooperatively with each other so as to integrate various facilities and share data storage (or knowledge resources) accumulated by individual activities.

Conclusion

In this paper, we addressed an architectural framework for educational activities of persons. In particular, we proposed three-layers model, which is composed of educational environment, support system and person role. Our idea is to integrate them adjustably under the corresponding relationships among layers,

and transform interpretatively the concepts in the upper layer to those in the lower layer. Concerning with this approach, our objective is to investigate knowledge handling mechanism from a viewpoint of person activity. The effectual results discussed in this paper are as follows:

1)framework of seamless personal activities among educational environments;

2)framework to be supported practically by computers.

Of course, currently these frameworks are not always sufficiently investigated: in particular, the integration of individual frameworks should be addressed strongly. Also, we should establish the educational knowledge handling paradigm and implement effectual educational support environment and functionality-oriented mechanism on our Internet world[7].

As our next step for managing personal knowledge activity, we should investigate the total architectural framework which makes the interactive structure among various types of knowledge operations clear[8].

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We would like to thank our research members in the Lab. for their eager discussion and cooperation.

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Table 1: Person role in support system

	CAL (private learning)	CSCL (group learning)	CAI (group lecture)	ITS (private lesson)
student(self)	●	●	●	●
student(other)		●	●	◉
speaker		◉		
coordinator		◉		
teacher			●	
tutor				●

[Note] ● : elements in inherent frame, ◉ : elements in extended frame

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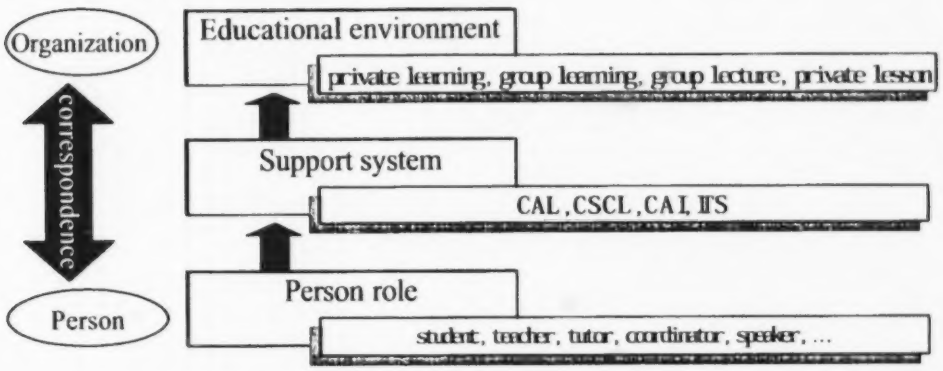

Figure 1: Educational support architecture

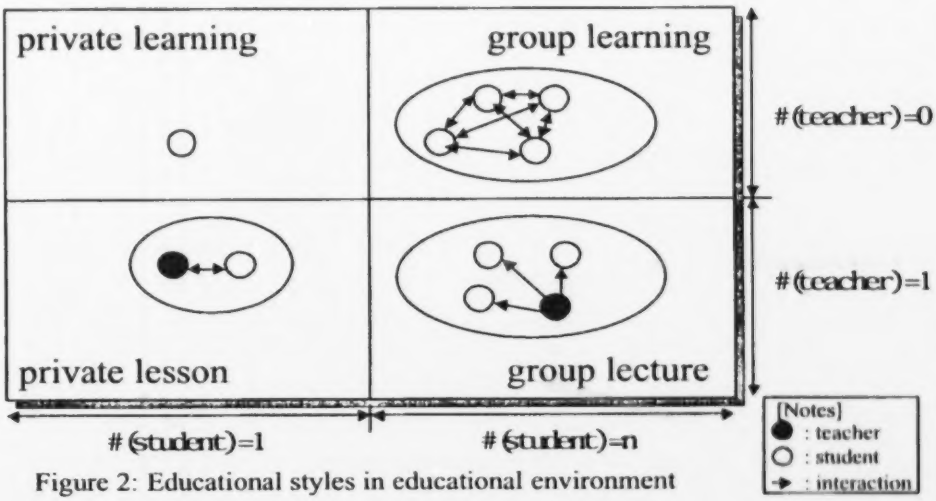

Figure 2: Educational styles in educational environment

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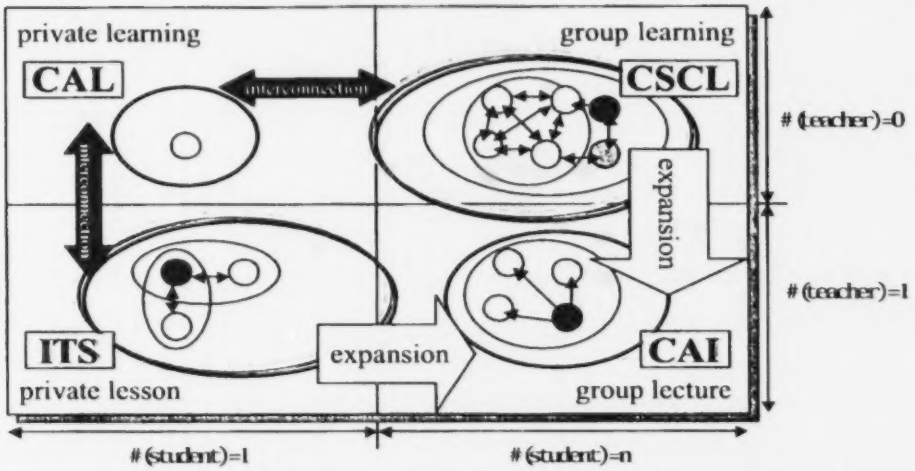

Figure 3: Educational styles and educational support systems

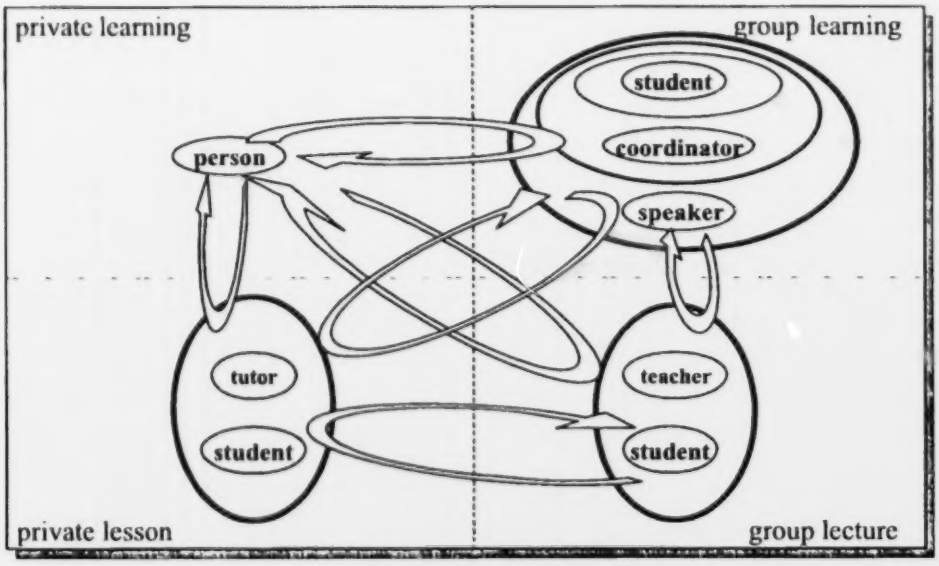

Figure 4: Transitive relationship

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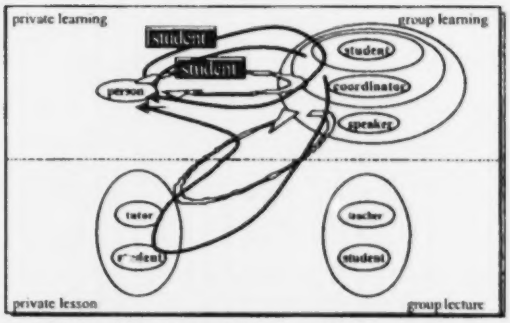
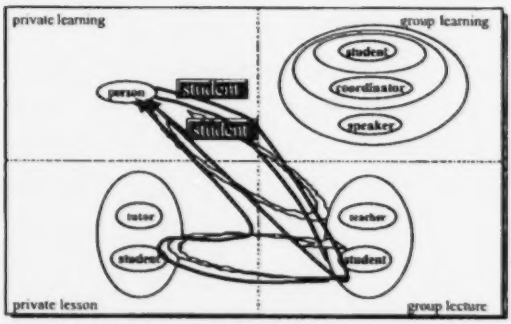
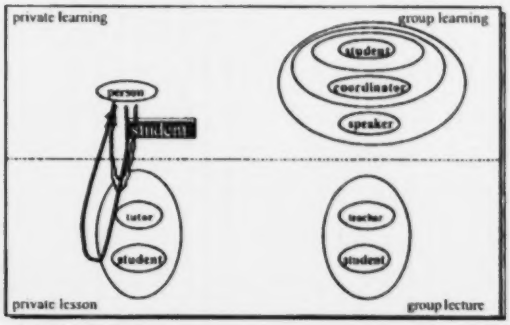


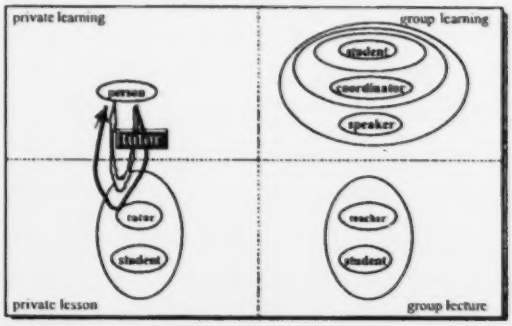
a) CSCL with/without ITS, as student



b) CAI with/without ITS, as student



c) ITS, as student



d) ITS, as tutor

Figure 5: Transition among individual environments (1/2)

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